

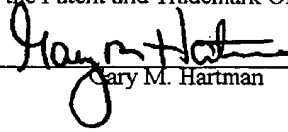
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Gary M. Hartman

January 18, 2007  
Date

U.S. Patent Application Serial No. **10/707,465**

**TECHNOLOGY CENTER 1700 PERSONNEL:**

**Attention: EXAMINER Roberts P. Culbert**  
**Phone: (571) 272-1433**

THE FOLLOWING **45** -PAGE DOCUMENT IS A

**RESPONSE AFTER FINAL**

including:

- ☐ Response under 37 CFR §1.116
- ☐ Notice of Appeal
- ☒ Appeal Brief under 37 CFR §41.37
- ☐ Reply Brief under 37 CFR §41.41
- ☐ Request for Continued Examination (RCE) Transmittal (two copies)
- ☒ Other: Fee Transmittal Form

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**FEE TRANSMITTAL  
for FY 2005**

Effective 10/01/2004, Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$ 620.00

## Complete if Known

Application Number	10/707,465
Filing Date	12/16/2003
First Named Inventor	M. A. Rosenzweig
Examiner Name	Roberts P. Culbert
Art Unit	1763
Attorney Docket No.	13DV-13863

## METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None☒ Deposit Account

Deposit Account Number

GENERAL ELECTRIC COMPANY

The Director is authorized for (check all that apply)

☒ Charge fee(s) indicated below ☒ Credit any overpayments☒ Charge any additional fee(s) or any underpayment of fee(s)☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

## FEE CALCULATION

## 1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 790	2001 395	Utility filing fee	
1002 350	2002 175	Design filing fee	
1003 550	2003 275	Plant filing fee	
1004 790	2004 395	Release filing fee	
1005 180	2005 80	Provisional filing fee	

SUBTOTAL (1) (\$ 0.00

## 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee From Table	Fee Paid
20	20 - 30 = 0	0	0.00
2	2 - 3 = 0	0	0.00
Multiple Dependent		0	0.00

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
1202 18	2202 9	Claims in excess of 20
1201 88	2201 44	Independent claims in excess of 3
1203 300	2203 150	Multiple dependent claim, if not paid
1204 88	2204 44	Release independent claims over original patent
1205 18	2205 9	Release claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 0.00

\*or number previously paid, if greater; For Release, see above

## FEE CALCULATION (continued)

## 3. ADDITIONAL FEES

Large Entity Small Entity

Fee Code (\$)	Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	2053 65	Non-English specification	
1812 2,520	2812 1,260	For filing a request for ex parte reexamination	
1804 820	2804 410	Requesting publication of SIR prior to Examiner action	
1805 1,840	2805 920	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	120.00
1252 430	2252 215	Extension for reply within second month	
1253 980	2253 490	Extension for reply within third month	
1204 1,630	2254 765	Extension for reply within fourth month	
1255 2,080	2255 1,040	Extension for reply within fifth month	
1401 340	2401 170	Notice of Appeal	
1402 340	2402 170	Filing a brief in support of an appeal	500.00
1403 300	2403 150	Request for oral hearing	
1451 1,510	2451 755	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,330	2453 665	Petition to revive - unintentional	
1501 1,378	2501 689	Utility issue fee (or release)	
1502 480	2502 240	Design issue fee	
1503 880	2503 440	Plant issue fee	
1480 130	2480 65	Petitions to the Commissioner	
1807 50	2807 25	Processing fee under 37 CFR 1.17(q)	
1808 180	2808 90	Submission of Information Disclosure Stmt	
6021 40	2021 20	Recording each patent assignment per property (times number of properties)	
1809 700	2809 350	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 700	2810 350	For each additional invention to be examined (37 CFR 1.129(b))	
1801 700	2801 350	Request for Continued Examination (RCE)	
1802 900	2802 450	Request for expedited examination of a design application	

Other fee (specify)

\*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$ 620.00

## SUBMITTED BY

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33,582

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Signature

Date January 18, 2007

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No. :	10/707,465	Confirmation No. <b>1464</b>
Applicant :	Mark A. Rosenzweig et al.	
Filed:	December 16, 2003	
TC/Art Unit:	1763	
Examiner :	Roberts P. Culbert	
Docket No. :	13DV-13863	
Customer No. :	30952	

Commissioner for Patents  
P.O. Box 1450  
Alexandria VA 22313-1450

**APPEAL BRIEF UNDER 37 CFR §41.37**

This is an appeal from the Examiner's final rejection made in an Office Action dated April 18, 2006 (Paper No. 0406), of claims pending in the above-identified US patent application.

Please charge the requisite fee and any other necessary charges to the General Electric Company, Deposit Account No. 07-0865, in accordance with the attached Fee Transmittal form.

01/22/2007 WASFAW1 00000104 070865 10707465

01 FC:1402 500.00 DA

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**REAL PARTY IN INTEREST**

The real party in interest is the General Electric Company, the  
assignee of record.

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### **RELATED APPEALS AND INTERFERENCES**

There are no prior or pending appeals or interferences known to Appellants or Appellants' assignee or Appellants' representative that would directly affect or be directly affected by or have a bearing on this appeal regarding the above-identified patent application.

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### **STATUS OF CLAIMS**

Claims 1-20 were originally presented in this application. Of these claims, all are pending, rejected, and the subject of this appeal.

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### **STATUS OF AMENDMENTS**

No amendments to the claims were filed by Appellants following the final rejection of April 18, 2006 (Paper No. 0406).



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### **SUMMARY OF CLAIMED SUBJECT MATTER**

As stated at Paragraphs [0001] and [0002] of their specification (all paragraph numbers are in reference to the numbering assigned by the USPTO authoring software), Appellants' invention is directed to aluminizing processes, by which a diffusion aluminide coating is deposited on a surface to form an environmentally protective coating. Appellants' invention particularly concerns aluminizing processes performed on internal passages of a component, such as cooling passages within a high pressure turbine blade, and removing oxide particles that become adhered to an aluminized surface as a result of the aluminizing process.

An aluminizing process by which oxide particles become adhered is described in Paragraph [0003]. Briefly, the process involves injecting into a passage a slurry containing a coating powder that includes a metallic aluminum source (such as aluminum or an aluminum alloy), a carrier or activator (such as an alkali metal halide), and an inert oxide dispersant (such as alumina ( $\text{Al}_2\text{O}_3$ ) or zirconia ( $\text{ZrO}_2$ )). These solid particulate components are mixed with an organic or inorganic liquid to form the slurry, which is then injected into the passage, dried, and heated to a temperature of about 930°C or more, at which the activator vaporizes and reacts with the aluminum source to form a volatile

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aluminum halide that reacts at the passage surfaces to form an aluminide coating.

As discussed in Paragraph [0004], removal of the remnants of the slurry following aluminizing is complicated because of the tendency for particles of the aluminum source to oxidize and sinter to the aluminized surfaces as a result of the high temperatures (930°C or more) sustained during the aluminizing process. More particularly, the adherent particles have proven to be very difficult to remove because, as explained in greater detail in Section (7) of Appellants' Declaration under 37 CFR §1.132 (the "Rule 132 Declaration")<sup>1</sup>, the particles form and adhere *in situ* through a combined process of oxidation of the particles, sintering of the particles, and aluminization of the walls, which results in the particles being firmly attached to the aluminized walls through a combination of (1) fusion with the wall surfaces as a result of the oxidation and sintering processes and (2) bonding with aluminum as a result of the aluminizing process. As such, the mechanism that attaches the oxidized aluminum-containing particles to a surface during aluminization of that surface is distinguishable from debris that simply collects on an existing surface, such as an existing aluminized surface, under other conditions, such as during

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<sup>1</sup> See the Evidence Appendix of this Brief.

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engine operation. Paragraph [0008].

Appellants' claimed process involves removing the oxidized aluminum-containing particles from an aluminized surface with an aqueous caustic hydroxide solution, preferably potassium hydroxide, and more preferably at least 100 grams of potassium hydroxide per liter of de-ionized water.

For the convenience of the Board, each independent claim involved in the appeal is reproduced below, immediately followed by a concise explanation of the subject matter defined in the claim.

Claim 1: A process comprising the steps of:  
forming an aluminized surface within an internal cavity of a component by placing within the internal cavity a material comprising metallic particles of an aluminum source and then heating the material and the component, wherein during heating some of the metallic particles oxidize and sinter to form adherent particles that are sintered to the aluminized surface; and then  
contacting the aluminized surface with an aqueous caustic hydroxide solution until the adherent particles are removed from the surface.

As recited in independent claim 1, Appellants' claimed process is specifically directed to removing adherent metallic particles that have oxidized and become sintered to an aluminized surface within an internal cavity of a component during an aluminizing process in which a material containing the

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metallic particles was placed and heated within the cavity. Paragraph [0005], first three sentences. Removal of the adherent metallic particles is by contacting the aluminized surface with an aqueous caustic hydroxide solution. Paragraph [0006], first sentence.

Claim 15: A process comprising the steps of:  
forming an aluminized surface within an internal cavity of a gas turbine engine component by injecting a slurry into the internal cavity and then heating the slurry and the component, the slurry comprising metallic particles of an aluminum source, oxide particles, and an activator that are mixed and suspended in a liquid vehicle, the activator vaporizing during heating to react with the metallic particles and form a volatile aluminum halide, wherein during heating some of the metallic particles oxidize and sinter to form oxidized particles that are sintered to the aluminized surface;  
removing the oxidized particles from the aluminized surface by immersing the aluminized surface in an ultrasonically-agitated solution containing at least 100 grams/liter of potassium hydroxide and the balance essentially de-ionized water; and then  
rinsing the internal cavity with water to remove the solution.

From the above, it can be seen that independent claim 15 contains limitations found in independent claim 1, with the following additional limitations. The component is a gas turbine engine component. Paragraph [0008], last sentence. The metallic particles contain an aluminum source, and the material containing the metallic particles is a slurry that further contains oxide particles and an activator that are mixed and suspended in a liquid vehicle. Paragraphs [0003] and [0009]. When heated during the aluminizing process, the activator

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vaporizes to react with the metallic particles and form a volatile aluminum halide. Paragraph [0003]. Removal of the oxidized particles is by immersion in an ultrasonically-agitated aqueous solution containing at least 100 grams/liter of potassium hydroxide. Paragraph [0010]. Finally, the internal cavity is rinsed with water to remove the solution. Paragraph [0010]

In summary, Appellants teach and claim a process by which an aqueous caustic hydroxide solution is used to remove metallic particles from an aluminized surface to which the particles are firmly attached through a combination of (1) fusion with the surface as a result of the oxidation and sintering processes and (2) bonding with aluminum from the aluminizing process.

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### **GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

A concise statement of each ground of rejection presented for review follows:

a) Whether Claims 1-10 and 14-20 are patentable over Appellants' admitted prior art (APA) in view of U.S. Patent No. 6,475,289 to Schilbe et al. (Schilbe) or U.S. Patent No. 6,265,022 to Fernihough et al. (Fernihough), applied under 35 USC §103.

b) Whether Claims 11-13 are patentable over the APA in view of Schilbe or Fernihough, and in further view of U.S. Patent No. 5,707,453 to Shurman et al. (Shurman), applied under 35 USC §103.

c) Whether Claims 1-11 and 13-20 are patentable over the APA in view of U.S. Patent Application Publication No. 2005/0035086 to Chen et al. (Chen), applied under 35 USC §103.

d) Whether Claim 12 is patentable over the APA in view of Chen in further view of Shurman, applied under 35 USC §103.

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## **ARGUMENT**

### **(A.1) Rejection under 35 USC §103 over the APA and Schilbe or Fernihough**

In the Office Action dated December 16, 2005 (Paper No. 1205), the Examiner explained that the APA was applied against Claims 1-10 and 14-20, for generally disclosing and teaching each step of Appellants' claimed process except "contacting the aluminized surface with an aqueous caustic hydroxide solution until the adherent particles are removed from the surface." Office Action (Paper No. 1205), page 3.<sup>2</sup> In other words, the APA applied by the Examiner is the aluminizing process described in Paragraph [0003] of Appellants' specification, which Appellants acknowledge is in the prior art. The Examiner then applied Schilbe and Fernihough as follows:

Schilbe et al. teach that a suitable caustic compound for removal of oxidized particles from the internal cavities of turbine components is an aqueous hydroxide solution (balance water) such as potassium hydroxide (KOH). (See

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<sup>2</sup> The grounds for applying the APA were repeated in the final Office Action dated April 18, 2006 (Paper No. 0406).

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Col. 3, Lines 37-44). . . .

It would have been obvious to one of ordinary skill in the art at the time of invention to use the caustics (KOH) well known in the art for removal of adherent oxides from the internal surfaces of turbine components.

Office Action (Paper No. 1205) at page 3.

Fernihough et al. teaches that (KOH) is suitable caustic compound for removal of ceramic or metallic particles from internal surfaces of a turbine component after an aluminizing process. (Col. 6, Lines 28-30).

It would have been obvious to one of ordinary skill in the art at the time of invention to use (KOH) after an aluminizing process in order to remove residual metal oxides (ceramic) from the internal surfaces of turbine components.

Office Action (Paper No. 1205) at page 3.

In response, Appellants presented arguments in an Amendment filed March 16, 2006, by which Appellants attempted to distinguish the particles removed by Appellants' claimed process from those removed by the processes of Schilbe and Fernihough. Specifically,

Schilbe is concerned with removing "accumulated oxides and dirt from the internal passage" of "an engine-run gas turbine engine airfoil." Therefore, the oxides and dirt removed by Schilbe's process are not adhered to Schilbe's internal passage in the same manner as the aluminum-containing particles oxidized and sintered *in situ* during an aluminizing process of a surface to which the particles adhere and are then removed according to Applicants'



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claimed process.

Fernihough is concerned with removing from a cooling hole 4 a plug material 6b formed by partially sintering ceramic or metallic particles. While the plug material 6b is within the cooling hole 4 before a coating process is performed, the resulting coating 9 is not deposited on the surface of the hole 4 contacted by the plug material 6b (see Figure 3g). Therefore, the sintered ceramic or metallic particles removed by Fernihough are not adhered to Fernihough's cooling hole 4 in the same manner as the aluminum-containing particles oxidized and sintered *in situ* during an aluminiding process of a surface to which the particles adhere and are then removed according to Applicants' claimed process.

Amendment filed March 16, 2006, pages 13-14.

In view of the above, Appellants argued that Schilbe and Fernihough "do not provide any basis for a reasonable expectation of success that adherent oxidized metallic particles formed *in situ* during an aluminiding process of the same surface to which the particles are concurrently sintered (the APA) could be removed with a caustic hydroxide solution." Amendment filed March 16, 2006, pages 14-15.

In the final Office Action dated April 18, 2006 (Paper No. 0406), the Examiner explained

Applicant concludes that there is no reasonable expectation that the KOH will remove the oxides. However, applicant has provided only unsupported argument that the sintered

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oxides after formation are somehow different or are bonded in a different manner. One of ordinary skill in the art at the time of invention would have had a reasonable expectation of success since the prior art references teach contacting the sintered oxides of a turbine component with a caustic hydroxide solution such as KOH to effectively remove the oxides.

Office Action (Paper No. 0406) at page 2.

In response, Appellants submitted their attached Rule 132 Declaration, by which they presented their credentials, fairly establishing Appellants as experts in the art. As this Honorable Board of Appeals is aware,

Although factual evidence is preferable to opinion testimony, such testimony is entitled to consideration and some weight so long as the opinion is not on the ultimate legal conclusion at issue. While an opinion as to a legal conclusion is not entitled to any weight, the underlying basis for the opinion may be persuasive. *In re Chilowsky*, 306 F.2d 908, 134 USPQ 515 (CCPA 1962) (expert opinion that an application meets the requirements of 35 U.S.C. 112 is not entitled to any weight; however, facts supporting a basis for deciding that the specification complies with 35 U.S.C. 112 are entitled to some weight); *In re Lindell*, 385 F.2d 453, 155 USPQ 521 (CCPA 1967) (Although an affiant's or declarant's opinion on the ultimate legal issue is not evidence in the case, "some weight ought to be given to a persuasively supported statement of one skilled in the art on what was not obvious to him." 385 F.2d at 456, 155 USPQ at 524 (emphasis in original)).

MPEP 716.01(c) III.

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In their Rule 132 Declaration, Appellants provided a technical explanation of the differences between the sintered oxides removed by Appellants' process and the dirt deposits and ceramic plugs removed by Schilbe and Fernihough, respectively. In particular, Appellants made the following observations which, based on Appellants' expertise, are facts and not merely opinion.

Citing facts reported in internal confidential reports of the assignee documenting the nature of dirt deposits (such as Schilbe's) in gas turbine engines, Appellants stated the following in their Rule 132 Declaration.

Oxide particles from engine dirt and debris typically comprise components based upon aluminosilicates modified with iron, magnesium, calcium, potassium, and other potential impurities. While pure alumina may be present in the dirt deposits, many other chemicals are also present. The microstructure of these dirt deposits may range from polycrystalline to amorphous or even glassy. The interface with the base metal is typically well defined with only limited interaction with the deposit, since the operating environment on the internal cavities is less than about 1600°F.

Rule 132 Declaration at Section (8)(a).

From Fernihough's disclosure, Appellants concluded

Fernihough seems to emphasize ceramic plugs that contain mixtures of ceramic components and possibly also organic binders. It is important to note that the plug material is a foreign material introduced to the component. It would be expected to have a definite physical and chemical interface

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between the component base metal and the ceramic plug. Also the intended temporary nature of the ceramic plug would lead toward the tendency for it to be porous and contain only a green strength and not be fully hard and densified. . . . So in summary, the plug material of Fernihough can be inferred to be porous, not well bonded to the substrate, formed at low temperatures, and possibly containing many constituents other than pure alumina.

Rule 132 Declaration at Section (8)(c).

Appellants distinguished the oxidized metallic particles removed by their claimed process as follows:

We and our co-inventors conceived the claimed process after encountering difficulties with removing oxidized coating particles that had sintered to internal wall surfaces following aluminization of the walls. Because the particles form and adhere in-situ through a combined process of oxidation of the particles, sintering of the particles, and aluminization of the walls, the particles are firmly attached to the aluminized walls through a combination of fusion with the wall surfaces as a result of the oxidation and sintering processes and bonding with aluminum from the aluminizing process.

Rule 132 Declaration at Section (7).

Based on the above findings, Appellants concluded

While caustic solutions have been known to clean and remove oxides from turbine components, it was not obvious that caustic solutions would successfully remove the distinctly different, well-bonded, and chemically pure, aluminum oxides formed in-situ by an aluminizing process.

Rule 132 Declaration at Section (8)(d).

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In summary, while Schilbe and Fernihough can be argued as disclosing the capability of removing oxides with a caustic hydroxide solution, the oxides removed by Schilbe and Fernihough are not formed *in situ* during an aluminizing process of the same surface to which the particles are concurrently sintered. As a result, Schilbe's and Fernihough's oxides are not

firmly attached to the aluminized walls through a combination of fusion with the wall surfaces as a result of the oxidation and sintering processes and bonding with aluminum from the aluminizing process.

Rule 132 Declaration at Section (7).

Because their processes do not involve aluminizing a surface, Appellants believe that Schilbe and Fernihough do not provide a reasonable expectation of success for using of a caustic hydroxide solution to remove oxide particles that are not just sintered to a surface, but are metallic particles that are oxidized, sintered, and aluminized to a surface. As such, Appellants respectfully maintain their position that

The [references] disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be "obvious to try" is not a legitimate test of patentability.

MPEP §2145X.B., citing *In re Fine*, 5 USPQ2d 1596, 1599 (Fed. Cir. 1988), citing *In re Geiger*, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987).

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For all of the above reasons, Appellants believe that Schilbe and Fernihough fail to suggest, with the requisite likelihood of success, modifying the teachings of the APA to arrive at Appellants' process recited in Claims 1-11 and 14-20. Appellants therefore respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claims 1-11 and 14-20 under 35 USC §103.

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**(A.2) Rejection under 35 USC §103 over the APA, Schilbe or Fernihough,  
and Shurman**

Appellants' claims 11 through 13, which depend from claim 1, add the additional limitation that the caustic solution is agitated while in contact with the aluminized surface being treated. Shurman was merely applied under this rejection for disclosing ultrasonic-assisted treatments. Because Shurman does not have any bearing on any of the arguments made above regarding the teachings of the APA, Schilbe, and Fernihough, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of claims 11 through 13 under 35 USC §103.

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**(A.3) Rejection under 35 USC §103 over the APA and Chen**

Under this rejection directed to Claims 1-11 and 13-20, Chen was essentially substituted for Schilbe and Fernihough as the secondary reference. Therefore, as discussed in Section (A.1) above, the APA was applied under this rejection for generally disclosing and teaching each step of Appellants' claimed process except contacting the aluminized surface with an aqueous caustic hydroxide solution to remove adherent particles from the surface.

In the Office Action dated December 16, 2005 (Paper No. 1205), the Examiner applied Chen as follows:

Chen et al. teaches using a KOH solution having a temperature of 60-100°C a concentration of 10-50% and a cleaning time of 20 min to 4 hours, (Paragraphs 37-38) and using ultrasonic agitation. (Paragraphs 39 and 34). . . .

It would have been obvious to one of ordinary skill in the art at the time of invention to use the caustic solution of Chen et al. since Chen et al. teaches that the solution is well suited for removal of metal oxides and the like from the internal surfaces of turbine components.

Office Action (Paper No. 1205) at page 5.

In response, Appellants presented arguments in the Amendment filed March 16, 2006, by which Appellants attempted to distinguish the particles



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removed by Appellants' claimed process from those removed by Chen.

Specifically, Appellants explained

Chen is concerned with removing a "degraded coating" with a caustic hydroxide solution (see paragraph [0037]). The meaning of the term "degraded coating" is not entirely clear from Chen. Chen teaches removing "hot corrosion products" from an aluminide coating with an acetic acid solution, grit blasting, etc. (paragraphs [0028]-[0031]). Further processing then appears to address the removal of "residual degraded material" (paragraphs [0032]-[0036]). Finally, Chen discusses the removal of "the degraded coating" with the caustic hydroxide solution.

Amendment filed March 16, 2006, page 14.

Appellants then argued that Chen

[does] not provide any basis for a reasonable expectation of success that adherent oxidized metallic particles formed *in situ* during an aluminiding process of the same surface to which the particles are concurrently sintered (the APA) could be removed with a caustic hydroxide solution.

Amendment filed March 16, 2006, pages 14-15.

As discussed in Section (A.1) above, the Examiner responded in the final Office Action dated April 18, 2006 (Paper No. 0406), by stating that "applicant has provided only unsupported argument that the sintered oxides after formation are somehow different or are bonded in a different manner." Office Action

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(Paper No. 0406) at page 2.

In response, in their Rule 132 Declaration, Appellants explained the differences between the sintered oxides removed by their process and the hot corrosion deposits removed by Chen. In particular, Appellants made the following observations which, based on Appellants' expertise, are facts and not merely opinion.

Citing facts reported in internal confidential reports of the assignee documenting the nature of hot corrosion deposits (such as Chen's) in gas turbine engines, Appellants stated that

Hot corrosion products are formed by definition in the presence of corrodants, typically a sodium and sulfur containing compound. The nature of hot corrosion is to break down and flux the protective alumina scale that forms on bare or coated nickel-based superalloys. The scale formed typically is mixture of alumina plus nickel and chromium oxides. The scale may contain impurities contributed by the corrodant, (primarily Na and S), from the base metal (Ti, Ta, W, Mo, etc.), and from the ever-present engine dirt (Ca, Fe, Mg, K, etc.). The microstructure of hot corrosion products is typically voluminous, layered, porous, and non-adherent, which contribute to the rapid degradation from hot corrosion. While the corrosion products are formed by chemical reaction with the base metal or coating, the interface temperatures typically are less than 1700°F at the corrosion front.

Rule 132 Declaration at Section (8)(b).

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Again, Appellants distinguished the oxidized metallic particles removed by their claimed process as

firmly attached to the aluminized walls through a combination of fusion with the wall surfaces as a result of the oxidation and sintering processes and bonding with aluminum from the aluminizing process.

Rule 132 Declaration at Section (7).

Based on the above findings, Appellants concluded

While caustic solutions have been known to clean and remove oxides from turbine components, it was not obvious that caustic solutions would successfully remove the distinctly different, well-bonded, and chemically pure, aluminum oxides formed in-situ by an aluminizing process.

Rule 132 Declaration at Section (8)(d).

In summary, Chen can be argued as disclosing the capability of caustic hydroxide solutions to remove Chen's "voluminous, layered, porous, and non-adherent" hot corrosion products, but not Appellants' oxidized metallic particles formed *in situ* during an aluminizing process of the same surface to which the particles are concurrently sintered. As a result, Chen's oxides are not

firmly attached to the aluminized walls through a combination of fusion with the wall surfaces as a result of the oxidation and sintering processes and bonding with

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aluminum from the aluminizing process.

Rule 132 Declaration at Section (7).

Because Chen's process does not involve aluminizing a surface, Appellants believe that Chen does not provide a reasonable expectation of success for using of a caustic hydroxide solution to remove oxide particles that are not just sintered to a surface, but are metallic particles that are oxidized, sintered, and aluminized to a surface. As such, Appellants respectfully maintain their position that

The [references] disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be "obvious to try" is not a legitimate test of patentability.

MPEP §2145X.B., citing *In re Fine*, 5 USPQ2d 1596, 1599 (Fed. Cir. 1988), citing *In re Geiger*, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987).

For all of the above reasons, Appellants believe that Chen fails to suggest, with the requisite likelihood of success, modifying the teachings of the APA to arrive at Appellants' process recited in Claims 1-11 and 13-20. Appellants therefore respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of Claims 1-11 and 13-20 under 35 USC §103.

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**(A.4) Rejection under 35 USC §103 over the APA, Chen, and Shurman**

As with the rejection of claims 11 through 13 discussed in Section (A.2) above, Appellants' claim 12, which depends from claim 1, adds the additional limitation that the caustic solution is agitated while in contact with the aluminized surface being treated. Because Shurman does not have any bearing on any of the arguments made above regarding the teachings of the APA and Chen, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejection of claim 12 under 35 USC §103.

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### **Concluding Remarks Regarding Appellants' Rule 132 Declaration**

In an Advisory Action dated October 17, 2006 (Paper No. 1006), the Examiner explained that Appellants' Rule 132 Declaration "argues" but "provides no evidence" regarding the characterization of Appellants' oxide particles and those removed by Schilbe, Fernihough, and Chen, or as to whether "the alleged differences are large enough that one skilled in the art would expect KOH to be unsuitable [sic] for removal of one but not the other." However, Appellants' Rule 132 Declaration does not merely state opinions, but states facts (as Appellants know them) based on examinations and analysis. That these facts are not presented in the form an exhibit does not alter their source (actual test hardware) or the reliability of the analysis (Appellants' credentials as experts in the art).

Because the Examiner has not refuted any of Appellants's statements made in their Rule 132 Declaration, Appellants respectfully believe that the Examiner has failed to give any weight to Appellants' Rule 132 Declaration, contrary to the instructions that

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Although factual evidence is preferable to opinion testimony, such testimony is entitled to consideration and some weight . . . "some weight ought to be given to a persuasively supported statement of one skilled in the art on what was not obvious to him."

MPEP 716.01(c) III.

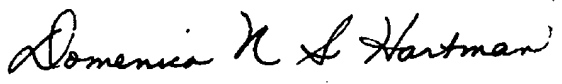
Appellants respectfully request that this Honorable Board of Appeals give their Rule 132 Declaration "consideration and some weight."

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**CLOSING**

For all of the reasons set forth above, Appellants respectfully request that this Honorable Board of Appeals reverse the Examiner's rejections of claims 1-20 under 35 USC §103.

Respectfully submitted,

By   
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January 18, 2007  
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Attachments: Claims Appendix; Evidence Appendix; Related Proceedings Appendix



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### **Claim Appendix**

Claim 1: A process comprising the steps of:

forming an aluminized surface within an internal cavity of a component by placing within the internal cavity a material comprising metallic particles of an aluminum source and then heating the material and the component, wherein during heating some of the metallic particles oxidize and sinter to form adherent particles that are sintered to the aluminized surface; and then

contacting the aluminized surface with an aqueous caustic hydroxide solution until the adherent particles are removed from the surface.

Claim 2: The process according to claim 1, wherein the solution contains at least 100 grams/liter of potassium hydroxide and the balance essentially de-ionized water.

Claim 3: The process according to claim 1, wherein the solution contains about 175 to about 225 grams/liter of potassium hydroxide and the balance essentially de-ionized water.

Claim 4: The process according to claim 1, wherein the solution

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consists of about 175 to about 225 grams/liter of potassium hydroxide and the balance de-ionized water.

Claim 5: The process according to claim 1, wherein the aluminizing step comprises a slurry aluminizing process in which the material comprises the metallic particles suspended in a liquid vehicle.

Claim 6: The process according to claim 1, wherein the adherent particles comprise metallic particles whose outer surfaces are oxidized.

Claim 7: The process according to claim 1, wherein the forming step results in oxide particles being sintered to the aluminized surface, and the oxide particles are removed from the aluminized surface by the contacting step.

Claim 8: The process according to claim 1, wherein the contacting step is performed at a temperature of about 66°C to about 88°C.

Claim 9: The process according to claim 1, wherein the contacting step is performed at atmospheric pressure.

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Claim 10: The process according to claim 1, wherein the contacting step is performed for a duration of at least two hours.

Claim 11: The process according to claim 1, further comprising the step of agitating the solution while the solution contacts the surface.

Claim 12: The process according to claim 11, wherein the agitating step is performed with ultrasonic energy at a frequency of about 20 kHz to about 40 kHz and a power level of about 80 to about 450 watts per liter of the solution.

Claim 13: The process according to claim 11, wherein the agitating step is performed for a duration of at least two hours.

Claim 14: The process according to claim 1, wherein the component is a gas turbine engine component and the internal cavity is a cooling passage.

Claim 15: A process comprising the steps of:  
forming an aluminized surface within an internal cavity of a gas turbine engine component by injecting a slurry into the internal cavity and then heating

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the slurry and the component, the slurry comprising metallic particles of an aluminum source, oxide particles, and an activator that are mixed and suspended in a liquid vehicle, the activator vaporizing during heating to react with the metallic particles and form a volatile aluminum halide, wherein during heating some of the metallic particles oxidize and sinter to form oxidized particles that are sintered to the aluminized surface;

removing the oxidized particles from the aluminized surface by immersing the aluminized surface in an ultrasonically-agitated solution containing at least 100 grams/liter of potassium hydroxide and the balance essentially de-ionized water; and then

rinsing the internal cavity with water to remove the solution.

Claim 16: The process according to claim 15, wherein the solution consists of potassium hydroxide and de-ionized water.

Claim 17: The process according to claim 15, wherein the solution consists of about 175 to about 225 grams/liter of potassium hydroxide and the balance de-ionized water.

Claim 18: The process according to claim 15, wherein some of the

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oxide particles sinter to the aluminized surface during the forming step and are subsequently removed from the aluminized surface during the removing step.

Claim 19: The process according to claim 15, wherein the removing step is performed at a temperature of about 71°C to about 77°C and at atmospheric pressure for a duration of about two to eight hours.

Claim 20: The process according to claim 15, wherein the component is a turbine blade.

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### **Evidence Appendix**

Appellants' Rule 132 Declaration, entered September 27, 2006 (number of pages: 7).

## **OFFICIAL**

PATENT

### **IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No. : 10/707,465 Confirmation No. **1464**  
Applicant : Mark A. Rosenzweig et al.  
Filed: : December 16, 2003  
TC/Art Unit: : 1763  
Examiner : Roberts P. Culbert  
  
Docket No. : 13DV-13863  
Customer No. : 30952

Commissioner for Patents  
P.O. Box 1450  
Alexandria VA 22313-1450

### **DECLARATION UNDER 37 CFR §1.132**

We, Mark A. Rosenzweig and Jeffrey A. Pfaendtner, depose and say that:

(1) We are joint inventors of the subject matter covered by the claims pending in the above-identified patent application ("Application").

(2) Mr. Rosenzweig was granted a Bachelor of Science degree in Metallurgical Engineering from the University of Pittsburgh, and has been employed as an engineer with General Electric Company, GE Aircraft Engines, from 1990 to 1995 and from 1997 to the present. During the course of his employment, he has been engaged in the research and development of oxidation and corrosion resistant coatings and thermal barrier coating systems for components of gas turbine engines, including the development of materials and deposition processes for such coating systems. Additionally, he has over

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seven years experience in development and application of chemical processes for turbine engine components, which includes cleaning, etching, coating removal, electroplating, anodizing, and painting.

(3) Mr. Pfaendtner was granted a B.S.E and Ph.D. from the University of Pennsylvania in Materials Science and Engineering, and has been employed as an engineer with General Electric Company, GE Aircraft Engines, from 1998 to the present. During the eight years of his employment, he has been engaged in the development of next-generation materials and processes for high-temperature protective coatings for use in the hot sections of jet engines (e.g., combustor, turbine, augmentor). These materials include metallic bond coat and environmental coatings, as well as ceramic thermal barrier coatings. Additionally, he has been active in the development of physical vapor and chemical vapor coating processes (PVD and CVD), as well as other chemical processes for the deposition of metallic and oxide coatings.

(4) The invention covered by the claims of the Application is a process for removing oxide particles that adhere to surfaces of internal cavities as a result of oxidation and sintering of coating particles to these surfaces during an aluminizing process in which the coating particles are the source of aluminum for aluminizing the surfaces. The invention uses an aqueous caustic hydroxide solution to remove the oxide particles from the aluminized surfaces.

(5) We understand that the claims of the Application are rejected as being obvious over the "Background of the Invention" in the Application in view



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of processes described in one or more of the following: U.S. Patent No. 6,475,289 to Schilbe et al. (Schilbe); U.S. Patent No. 6,265,022 to Fernihough et al. (Fernihough); U.S. Patent No. 5,707,453 to Shurman et al. (Shurman); and U.S. Patent Application Publication No. 2005/0035086 to Chen et al. (Chen).

(6) This Declaration is being submitted in a first response after a final rejection to address statements made by the Examiner in the final rejection that we had previously "provided only unsupported argument that the sintered oxides after formation are somehow different or are bonded in a different manner" than particles removed by Schilbe, Fernihough, Shurman, and Chen.

(7) We and our co-inventors conceived the claimed process after encountering difficulties with removing oxidized coating particles that had sintered to internal wall surfaces following aluminization of the walls. Because the particles form and adhere in-situ through a combined process of oxidation of the particles, sintering of the particles, and aluminization of the walls, the particles are firmly attached to the aluminized walls through a combination of fusion with the wall surfaces as a result of the oxidation and sintering processes and bonding with aluminum from the aluminizing process.

(8) While the use of KOH and other aqueous caustic hydroxide solutions to remove engine-deposited dirt (such as Schilbe and Shurman), hot corrosion products (such as Chen), and ceramic plugs (such as Fernihough) may have been known, the contaminants removed by Schilbe, Shurman,

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Chen, and Fernihough are so different from the oxidized, sintered, and aluminized particles we were trying to remove that it was not obvious to us or our co-inventors that a caustic solution such as KOH would work.

(a) The nature of dirt deposits (such as Schilbe and Shurman) is significantly different from aluminum oxide formed in-situ during aluminizing. Internal confidential GE reports documenting the nature of dirt deposits include GE Aircraft Engines Technical Memorandum 2000-117 and GE Research and Development Center Technical Information Series 99CRD167. Though these reports must be kept confidential, the following facts from these reports can be reported as follows. Oxide particles from engine dirt and debris typically comprise components based upon aluminosilicates modified with iron, magnesium, calcium, potassium, and other potential impurities. While pure alumina may be present in the dirt deposits, many other chemicals are also present. The microstructure of these dirt deposits may range from polycrystalline to amorphous or even glassy. The interface with the base metal is typically well defined with only limited interaction with the deposit, since the operating environment on the internal cavities is less than about 1600°F.

(b) The nature of hot corrosion deposits (such as Chen) is also significantly different from aluminum oxide formed in-situ during aluminizing. Internal confidential GE reports documenting the nature of hot corrosion products include GE Aircraft Engines Technical Memorandums 92-443 and 93-236. Though these reports must also

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remain confidential, the following facts from these reports can be reported as follows. Hot corrosion products are formed by definition in the presence of corrodants, typically a sodium and sulfur containing compound. The nature of hot corrosion is to break down and flux the protective alumina scale that forms on bare or coated nickel-based superalloys. The scale formed typically is mixture of alumina plus nickel and chromium oxides. The scale may contain impurities contributed by the corrodant, (primarily Na and S), from the base metal (Ti, Ta, W, Mo, etc.), and from the ever-present engine dirt (Ca, Fe, Mg, K, etc.). The microstructure of hot corrosion products is typically voluminous, layered, porous, and non-adherent, which contribute to the rapid degradation from hot corrosion. While the corrosion products are formed by chemical reaction with the base metal or coating, the interface temperatures typically are less than 1700°F at the corrosion front.

(c) The nature of ceramic plugs would also be significantly different from the aluminum oxide formed in-situ during aluminizing. The nature of the ceramic plug materials as described in Fernihough is not entirely clear. Reference is made to oxides of various metals, aluminum oxide being only one. Fernihough seems to emphasize ceramic plugs that contain mixtures of ceramic components and possibly also organic binders. It is important to note that the plug material is a foreign material introduced to the component. It would be expected to have a definite physical and chemical interface between the component base metal and the ceramic plug. Also the

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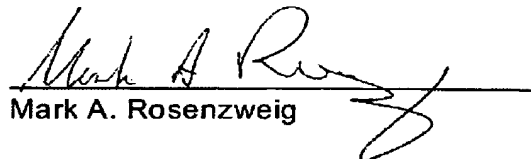
intended temporary nature of the ceramic plug would lead toward the tendency for it to be porous and contain only a green strength and not be fully hard and densified. It is not clear at what temperature that the plug material in Fernihough may be formed. Either the mask or plug material is organic (claim 6), and the mask material and/or plug is subjected to some unidentified temperature which either removes the mask and/or sinters the plug (column 6, lines 9-13). The temperature cannot be extremely high, perhaps less than 1000°F, given that one of the components is organic. Indeed, the plug material can be at least partially removed by subjecting it to 600°C for two hours (column 6, line 28). So in summary, the plug material of Fernihough can be inferred to be porous, not well bonded to the substrate, formed at low temperatures, and possibly containing many constituents other than pure alumina.

(d) By contrast, the material removed from the internal cavities of turbine components according to the Application can be characterized as pure alumina, either from the aluminum oxide powder (one of the components of the aluminizing mixture), or from aluminum oxide that only can form within the inert gas or partially reducing atmosphere of the aluminizing process. This pure alumina is well bonded to the surface by nature of the high temperature of formation (1700°F and greater) and by the nature of the growth by atomic diffusion. While caustic solutions have been known to clean and remove oxides from turbine components, it was not obvious that caustic solutions would successfully remove the distinctly different,

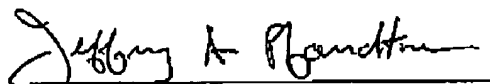
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well-bonded, and chemically pure, aluminum oxides formed in-situ by an aluminizing process.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

  
Mark A. Rosenzweig

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

 9-25-06  
Jeffrey A. Pfaendtner

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**Related Proceedings Appendix**

None.